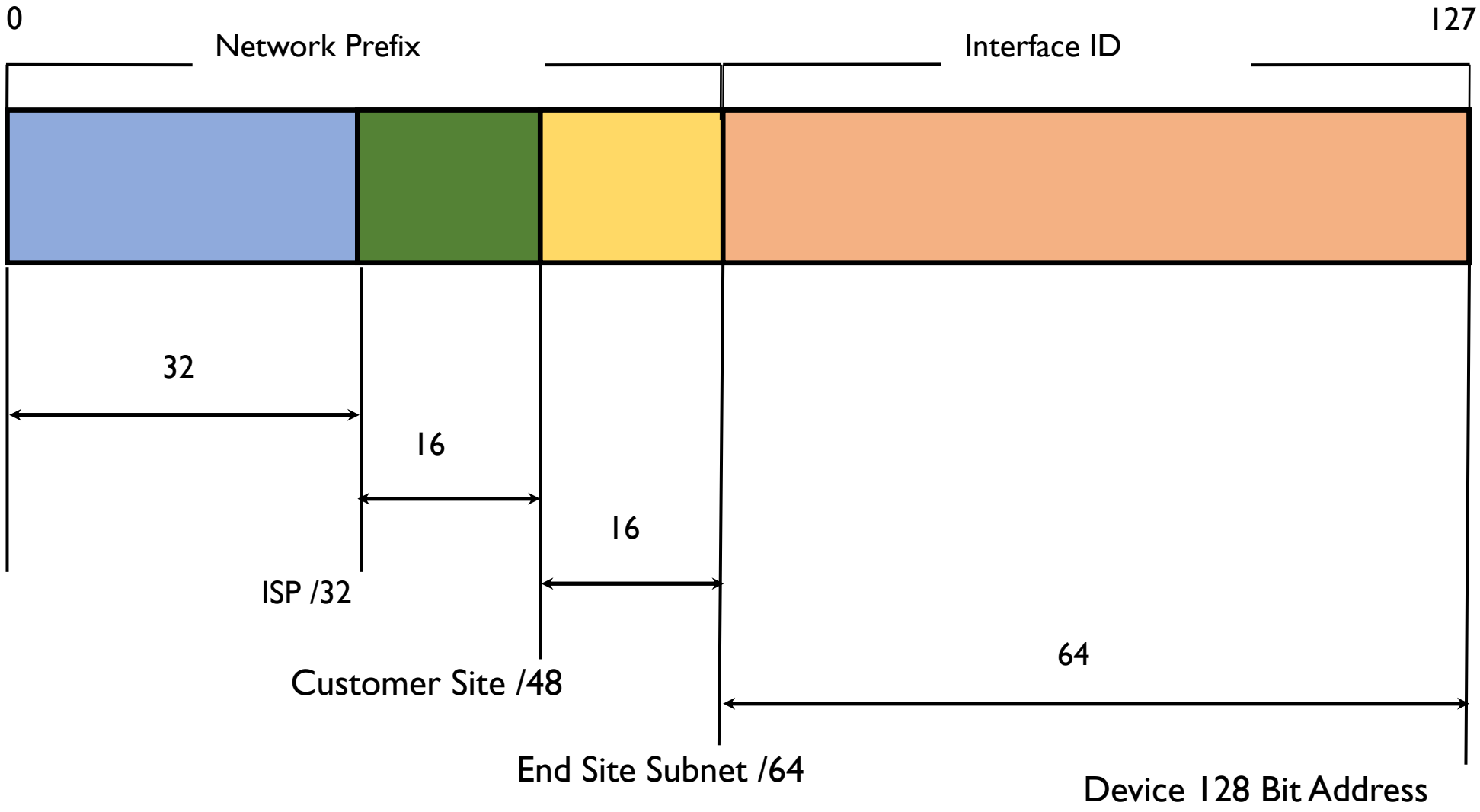
IPv6 Address Planning

WEBINAR COURSE

Overview

- IPv6 Address Recap
- Address Planning
  - ISP Infrastructure
  - Enterprise Customer
  - Broadband Customer
  - Data Centre
- Address Planning – Traffic Shaping & Routing
- Example Address Plan

IPv6 Address Recap



IPv6 Address Planning

- Network Operators allocated /32 by RIRs
- Global Routing prefix /48
  - /56 (ISPs to end site)
  - upstream could filter anything smaller
  - Consider the routing table size!

IPv6 Address Planning

- Future traffic engineering needs?
  - Contiguous assignment vs Split assignment
- Shift in thought:
  - IPv4: number of hosts
  - IPv6: number of subnets!

IPv6 Address Planning: ISP Infrastructure

- Loopbacks
- Point-to-Point links
- Internal Server LAN
  - also called NOC LAN
  - not seen from outside
- External Server LAN
  - Mail, DNS, etc

IPv6 Address Planning: ISP Infrastructure

- Dedicate a /40 (or /48) for the backbone infrastructure
  - Every infrastructure assignment from this block!
  - Carried by IGP (NOT iBGP)
- Loopbacks
  - Generally one /48 (/60 and /64 also common) for all loopbacks
    - /128 as each loopback address
- Point-to-Point links (e.g: one /48 for all P2P links)
  - RFC6164 recommends /127
    - Reserve /64 per link but use /127

IPv6 Address Planning: ISP Infrastructure

- Internal Server/NOC LAN
  - /60 (if different subnets within the NOC), or
  - /64

- External Server LAN
  - /64 (allows up to 2^64 services to be hosted)

IPv6 Address Planning: Enterprise Customer

- RFC6177:
  - Obsoletes RFC3177 specification, which recommended end-sites should get a /48 by default
  - Suggests that end-sites are still given more than a /64 to allow for future growth (multiple subnets)
    - Multiples of /64, or better still
    - /60, /56, or /52 (nibble boundaries)

IPv6 Address Planning: Enterprise Customer

- Consider regional delegation
  - Aggregation in mind!
  - /40 per region?
- One /48 per customer
  - Could be transit customers or leased line customers
  - Could be given additional /48s as they grow (more than 65K subnets)
- We also see ISPs give:
  - /52 or /56 to mid-sized customers ()
  - /60 for very small customers
  - /64 to end-sites NOT recommended!!

IPv6 Address Planning: Broadband Customer

- Depends on your deployment
  - ND-RA for CPE WAN side
    - A /64 prefix on BRAS can still support 2^64 CPEs through SLAAC
  - DHCPv6-PD for CPE LAN side
    - A /48 pool on each BRAS (65k /64s can be delegated)
- Dedicate a /40 (or bigger) for Broadband network
  - /48s out of the /40 to each BRAS
  - Announced in iBGP by BRAS

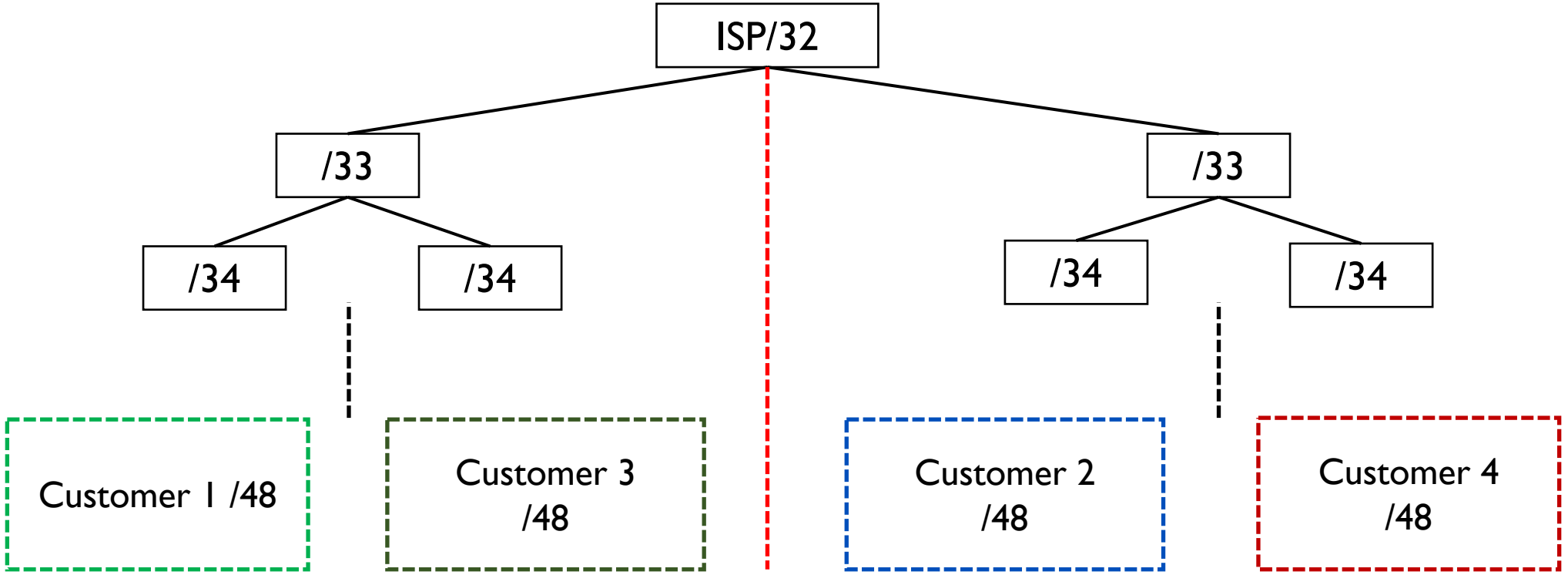
IPv6 Address Planning: DC Services

- DC infrastructure blocks from your infrastructure block
  - Loopbacks
  - PtP links
- Dedicate /40 for DC (hosted) services
  - Depends on DC architecture
  - Dedicated VLAN/subnet per service?
    - /64 per VLAN/subnet (2^64 servers)
  - Dedicated subnet per customer (customer buys VMs/hosts services)?
    - /64 per customer or subnet (2^64 VMs)
  - Announced in iBGP (DC border router)

IPv6 Address Planning: Traffic Shaping

- Borrow from IPv4
  - Sub-aggregates to shape traffic
  - Difficult with contiguous assignment
- Assign customer prefixes (that attract traffic) from both ends of address space
  - Infrastructure prefix do not attract traffic

IPv6 Address Planning: Traffic Shaping



- Customer prefixes assigned from each /33 sub-prefix
  - Similar to IPv4 sub-aggregates!
  - Allows us to balance incoming traffic

IPv6 Address Planning: Routing

- IGP to carry next-hop reachability information
  - Infrastructure blocks (PtPs, loopbacks)
  - Aggregation desirable in IGP

- Customer prefixes (Enterprise, broadband, DC customers/services)
  - Sub-aggregates for traffic shaping (multihoming)
  - Consider regional delegation
  - iBGP carries all customer prefixes
    - Aggregation may interfere with traffic shaping
  - Aggregation necessary in eBGP (pull up routes)

IPv6 Address Planning: Example

- ISP has **2001:0db8::/32** prefix
  - 16x /36s
  - easier to play at nibble boundaries

#	Prefix	Comments
1	2001:0db8:0000::/36	First /33
2	2001:0db8:1000::/36	
3	2001:0db8:2000::/36	
4	2001:0db8:3000::/36	
5	2001:0db8:4000::/36	
6	2001:0db8:5000::/36	
7	2001:0db8:6000::/36	
8	2001:0db8:7000::/36	
9	2001:0db8:8000::/36	Second /33
10	2001:0db8:9000::/36	
11	2001:0db8:a000::/36	
12	2001:0db8:b000::/36	
13	2001:0db8:c000::/36	
14	2001:0db8:d000::/36	
15	2001:0db8:e000::/36	
16	2001:0db8:f000::/36	

Example: High Level Plan

#	Prefix	Assignment	Comment
1	2001:0db8:0000::/36	Infrastructure + Customer	First /33
2	2001:0db8:1000::/36	Customer	
3	2001:0db8:2000::/36		
4	2001:0db8:3000::/36		
5	2001:0db8:4000::/36		
6	2001:0db8:5000::/36		
7	2001:0db8:6000::/36		
8	2001:0db8:7000::/36		
9	2001:0db8:8000::/36		Second /33
10	2001:0db8:9000::/36		
11	2001:0db8:a000::/36		
12	2001:0db8:b000::/36		
13	2001:0db8:c000::/36		
14	2001:0db8:d000::/36		
15	2001:0db8:e000::/36		
16	2001:0db8:f000::/36		

Example: High Level

#	Prefix	Assignment	Comment
1	2001:0db8:0000::/36	Infrastructure + Customers	First /33
1	2001:0db8:0000:0000::/40	Backbone Infra (PtP, Loopbacks)	
2	2001:0db8:0100:0000::/40	Enterprise Customer Reg1	
3	2001:0db8:0200:0000::/40	Broadband Region1	
4	2001:0db8:0300:0000::/40	Future Customers	
5	2001:0db8:0400:0000::/40		
6	2001:0db8:0500:0000::/40		
7	2001:0db8:0600:0000::/40		
:			
:			
:			
:			
16	2001:0db8:0f00:0000::/40		

Example: High Level

#	Prefix	Assignment	Comments
9	2001:0db8:8000::/36	Customers	Second /33
1	2001:0db8:8000::/40	Broadband Region2	
2	2001:0db8:8100::/40	Enterprise Customer Reg2	
3	2001:0db8:8200::/40	Future Customers	
4	2001:0db8:8300::/40		
5	2001:0db8:8400::/40		
6	2001:0db8:8500::/40		
7	2001:0db8:8600::/40		
:			
:			
:			
:			
16	2001:0db8:8f00::/40		

Example: Infrastructure

#	Prefix	Assignment	Comments
1	2001:0db8:0000::/36	Infrastructure + Customers	First /33
1	2001:0db8:0000::/40	Backbone Infrastructure	
1	2001:0db8:0000::/48	Loopbacks	
2	2001:0db8:0001::/48	Point-to-Point	
3	2001:0db8:0002::/48	Future Infra use	
4	2001:0db8:0003::/48		
5	2001:0db8:0004::/48		
6	2001:0db8:0005::/48		
:			
:			
:			
:			
256	2001:0db8:00ff::/48		

Example: Customers

#	Prefix	Assignment	Comments
1	2001:0db8:0000::/36	Infrastructure + Customers	First /33
2	2001:0db8:0100::/40	Enterprise Customer Reg1	
1	2001:0db8:0100::/48	Customer WAN links	
2	2001:0db8:0101::/48	Customer 1.1	
3	2001:0db8:0102::/48	Customer 1.2	
4	2001:0db8:0103::/48	Future Customers	
5	2001:0db8:0104::/48		
6	2001:0db8:0105::/48		
7	2001:0db8:0106::/48		
8	2001:0db8:0107::/48		
:			
:			
256	2001:0db8:01ff::/48		

Example: Customers

#	Prefix	Assignment	Comments
1	2001:0db8:0000::/36	Infrastructure + Customers	First /33
3	2001:0db8:0200::/40	Broadband Reg1	
1	2001:0db8:0100::/48	BRAS 1	
2	2001:0db8:0101::/48	BRAS 2	
3	2001:0db8:0102::/48	BRAS 3	
4	2001:0db8:0103::/48	Future Customers	
5	2001:0db8:0104::/48		
6	2001:0db8:0105::/48		
7	2001:0db8:0106::/48		
8	2001:0db8:0107::/48		
:			
:			
256	2001:0db8:01ff::/48		

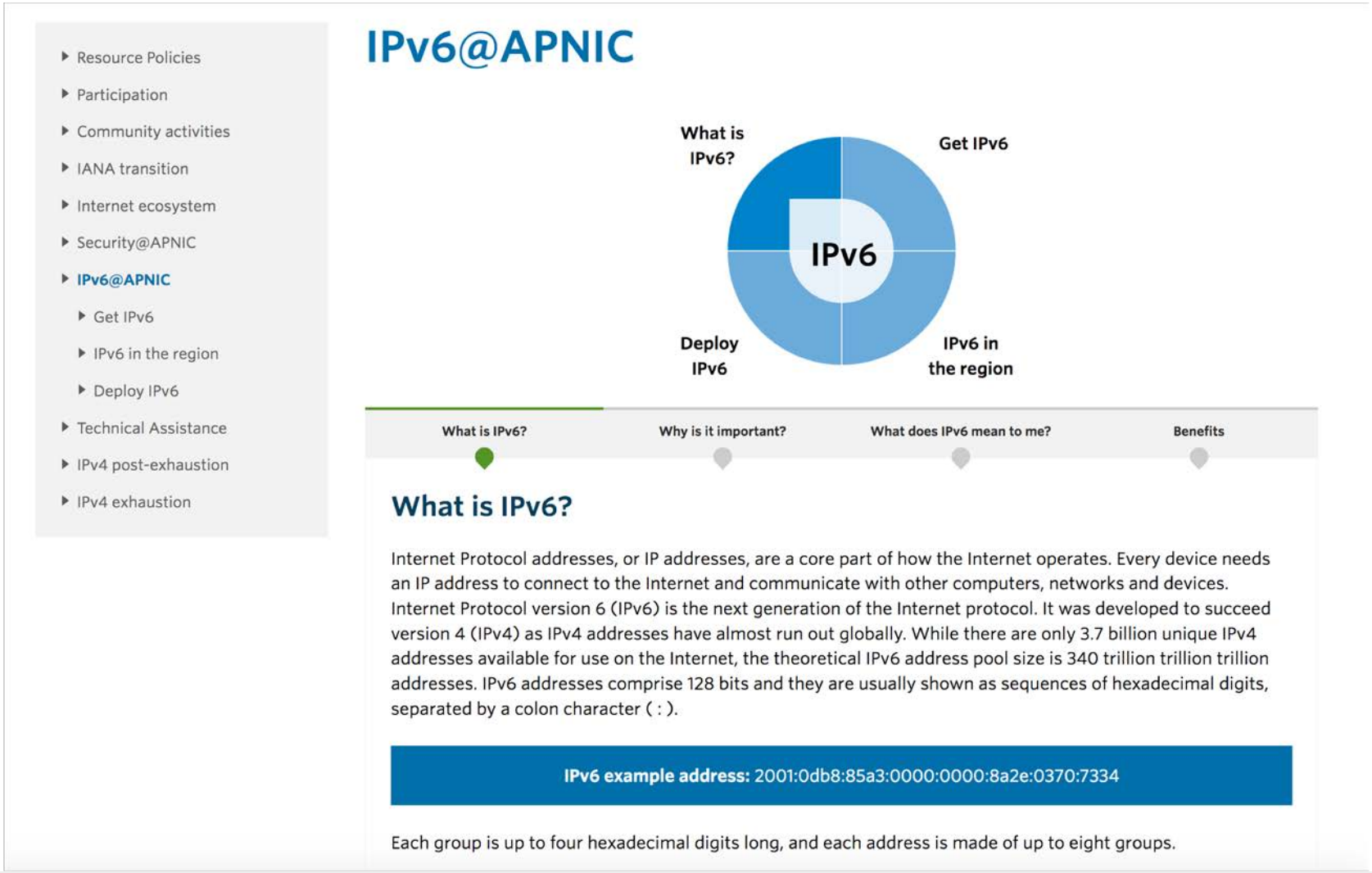
Example: Customers

#	Prefix	Assignment	Comments
9	2001:0db8:8000::/36	Customers	Second /33
1	2001:0db8:8000::/40	Broadband Reg2	
1	2001:0db8:8000::/48	BRAS1	
2	2001:0db8:8001::/48	BRAS2	
3	2001:0db8:8002::/48	BRAS3	
4	2001:0db8:8003::/48	Future BRAS	
5	2001:0db8:8004::/48		
:			
:			
:			
256	2001:0db8:80ff::/48		

Example: Customers

#	Prefix	Assignment	Comments
9	2001:0db8:8000::/36	Customers	Second /33
2	2001:0db8:8100::/40	Enterprise Customer Reg2	
1	2001:0db8:8100::/48	Customer 2.1	
2	2001:0db8:8101::/48	Customer 2.2	
3	2001:0db8:8102::/48	Future Customers	
4	2001:0db8:8103::/48		
5	2001:0db8:8104::/48		
:			
:			
:			
256	2001:0db8:81ff::/48		

IPv6@APNIC


Resource Policies
Participation
Community activities
IANA transition
Internet ecosystem
Security@APNIC
IPv6@APNIC
Get IPv6
IPv6 in the region
Deploy IPv6
Technical Assistance
IPv4 post-exhaustion
IPv4 exhaustion
IPv6@APNIC
What is IPv6?
Get IPv6
IPv6
Deploy IPv6
IPv6 in the region
What is IPv6?
Why is it important?
What does IPv6 mean to me?
Benefits
What is IPv6?
Internet Protocol addresses, or IP addresses, are a core part of how the Internet operates. Every device needs an IP address to connect to the Internet and communicate with other computers, networks and devices. Internet Protocol version 6 (IPv6) is the next generation of the Internet protocol. It was developed to succeed version 4 (IPv4) as IPv4 addresses have almost run out globally. While there are only 3.7 billion unique IPv4 addresses available for use on the Internet, the theoretical IPv6 address pool size is 340 trillion trillion trillion addresses. IPv6 addresses comprise 128 bits and they are usually shown as sequences of hexadecimal digits, separated by a colon character (:).
IPv6 example address: 2001:0db8:85a3:0000:0000:8a2e:0370:7334
Each group is up to four hexadecimal digits long, and each address is made of up to eight groups.

APNIC Helpdesk Chat

Helpdesk

APNIC Helpdesk provides assistance to all on matters related to APNIC Services, such as membership and IP address enquiries.

APNIC Helpdesk offers (through prior arrangement) multi-language phone support for the following: Bahasa Indonesia, Bahasa Malaysia, Burmese, Cantonese, English, Filipino (Tagalog), Hindi, Japanese, Mandarin, Sinhalese, Tamil and Telugu.

You may also find our FAQs helpful with your enquiries.

Contact details

Helpdesk hours	09:00 to 21:00 (UTC +10) Monday – Friday (closed for some public holidays)
Chat	APNIC Live Chat Online Click here to chat
Skype	Call ID: apnic-helpdesk
Email	helpdesk@apnic.net
Phone	+61 7 3858 3188
VoIP	helpdesk@voip.apnic.net Using VoIP
Fax	+ 61 7 3858 3199

Service Updates

Upgrade edge router firmware

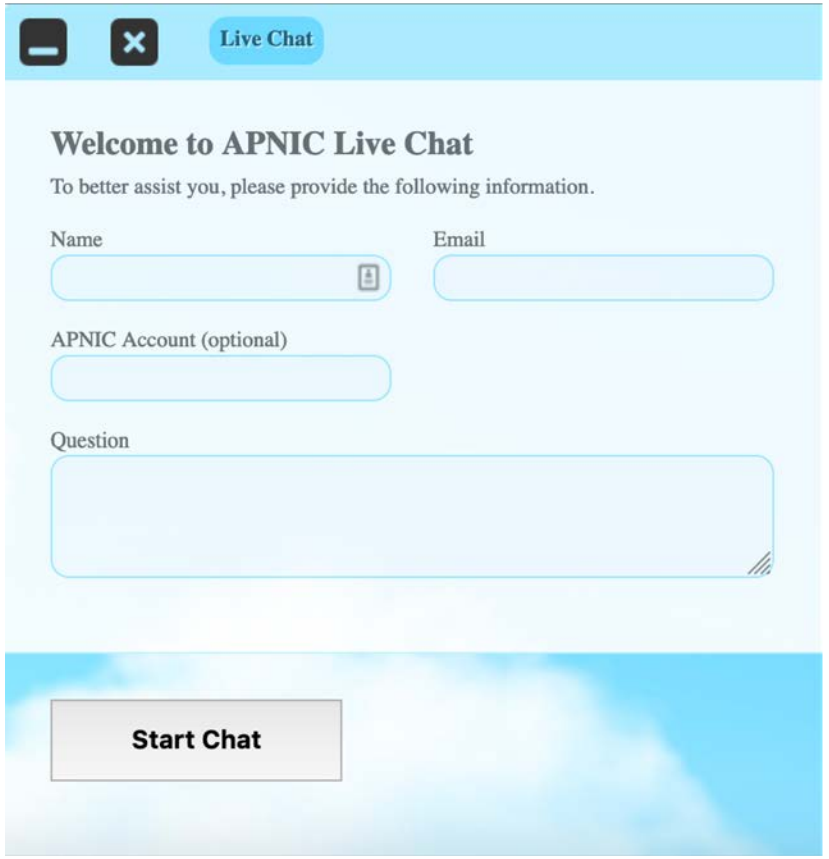
Start: Thursday, 31 January 2019 07:00 AM (UTC +10)
End: Thursday, 31 Jan 2019 08:00 AM (UTC +10)

This maintenance is required to upgrade our edge router firmware in DC2. There may be one or two interruptions to the services listed above for a maximum of 30 minutes within the change window.

More Updates

Subscribe to APNIC Service Announcements

Learn more about system maintenance



Acknowledgements

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